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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/674,703

09/30/2003

David L. O'Meara

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EXAMINER

GEORGE, PATRICIA ANN

ART UNIT

PAPER NUMBER

1765

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
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3 MONTHS

12/29/2006

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 12/29/2006.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/674,703

Applicant(s)

O'MEARA ET AL.

Examiner

Patricia A. George

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 5-18, 20, 21, 23, 24 and 30-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 5-18, 20-21, 23-24, 30-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
- Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1, 5-9, 12-13, 17, 20, 21, and 31-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Yin et al. of USPN 6379575.

Yin et al. discloses a well known and conventional method of monitoring the etching (i.e. erosion) status of both the system and the system components (i.e. protective coatings) in a processing system. Yin teaches the method of exposing a protective layer (i.e. system component - see section, Etching Process, first paragraph.) on a wafer substrate, consisting of silicon oxide and silicon nitride (col.10, line 63) to an activated cleaning gas (i.e. reactant gas – ab.) to clean (i.e. etch during a process – ab.) protective layer (i.e. system components) (col.4, l.1-24) without excessive erosion (i.e. form an erosion product – col.3, l.14). Release of the erosion product is determined (i.e. monitoring of erosion product to reach a threshold value as in claim 21– col.112, l.29-33) and the process step is continued or completed (i.e. stopped – col.12, l.30) by means of end point detection (col.12, l.29). The disclosures of Yin et al., above, teach all the limitations of applicants' claims 1, 21, and 31.

As to claim 5, Yin et al. discloses it is desirable to have a treatment that cleans and removes etchant deposits from system component/s (col.3, l.4-15).

As to claim 6, Yin et al. discloses the system component has a material deposited on it that contains silicon, silicon nitride, silicon oxide (col.10, l.63).

As to claim 7, Yin teaches substrate etching (ab.), chamber cleaning (ab.), and substrate film forming process (etch residue – ab.).

As to claims 8, 12, and 13, Yin discloses use of halogen-containing (col.11, l.16-18 and col.13, l.13-14) and Hf-containing (col.11, l.15) gases for etching or cleaning a substrate.

As to claim 9, Yin et al. discloses the following reactant gases for cleaning: NF.sub.3, CF.sub.4, SF.sub.6, C.sub.2 F.sub.6, CCl.sub.4, C.sub.2 Cl.sub.6 or mixtures thereof.

As for claim 17, Yin teaches operating the processing system at a chamber pressure of 0.1 to 400mTorr, which is overlapping and encompassed by the claimed range of between 10 mTorr and about 760 Torr during the exposing (col. 7, l. 33).

As for claim 20, Yin et al. discloses the monitoring is desirable and consists of an optical (col.12, l.29) monitoring system that detects light emission (col.12, l. 34) of a particular wavelength (col.12,l.34).

As to claim 32, Yin teaches a protective coating for components comprises aluminum nitride, boron carbide, boron nitride, diamond, silicon oxide, silicon carbide, silicon nitride, titanium oxide, titanium carbide, yttrium oxide, zirconium oxide, or mixtures thereof (ab.).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

As to claim 2, Yin et al. discloses the exposed system component comprises a process tube (col.8, l.9), a ring (col.9, l.58), chamber walls (ab.), an injector (col.9, l.35-40), a ceramic member (i.e. substrate holder – col.7, l.10-14), a cap cover (col.9, l.56-57), and an electrode (col.7, p.50-55).

It is noted that the reference of Tin, fails to recite the specifically defined system component structures defined in claim 2.

However, It would have been obvious to one of ordinary skill in the art at the time of invention was made, to process any structural form, including the structures listed in applicants' claim 2, according to the disclosed monitoring process disclosed by Yin because such a monitoring process would appear to be effective for any shaped structure since it is dependent on the chemical composition of the surface to be treated.

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For instance, if the monitoring process for SiN would be effective for a wafer coated with SiN, it would also be effective for an electrode having SiN on its surface.

Claim Rejections - 35 USC § 103

Claims 14-16 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yin et al. of USPN 6379575 (see discussion above) in view of Tsai et al. of USPN 6,592,817.

Yin et al. fails to teach specific process parameters, reactant gas, and apparatus limitations during a substrate film formation process as in claim 14, 15, 16, and 30.

As for claim 14, Tsai teaches monitoring the reactant gases containing at least one of a silicon-containing gas (col. 10, l. 63) and a nitrogen-containing gas for depositing a film (l. 3) during a substrate film formation process (col. 12, l. 3).

As for claim 15, Tsai teaches the reactant gas containing tetraethyl orthosilicate (TEOS) (col. 15, l. 7-15) for depositing a film during a substrate film formation process.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to modify the invention of end point detection, of Yin, to detect the end of a process using TEOS, Si, or N, as Tsai, because Yin teaches end point detection is well known and conventional.

As for claim 16, Tsai teaches during a thermal deposition process, a hot liquid is circulated through the chamber walls to maintain the chamber at elevated temperatures (col. 11, l. 46-49).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to use a CVD process that maintains the temperature of the chamber, by circulation of heat, because Tsai teaches it is desirable to stop such a process through end point, and Yin teaches an improved end point for CVD chambers.

As for claim 30, Tsai teaches all the elements of monitoring the release of halide species erosion products, such as silicon halide and silicon oxyhalide. Tsai teaches the deposition of silicon and silicon oxide (col. 3, l. 37 and 41) in the process chamber (col. 3, l. 32), the presence of halide ion (claim 8) which are contributed by etchants which are free fluorine radicals, NF₃ (col. 3, l. 50), then by conversion of gas to dissociated species (col. 3, l. 47-49), are monitored (claim 43) as a halide species erosion product. Because the chemistry of a halide species erosion products are present and monitored, halide species erosion products such as silicon halide and silicon oxyhalide exist.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to modify the invention of end point detection, of Yin, to detect the end of a process having halide species erosion products, because Tsai teaches it is desirable to stop such a process through end point, and Yin teaches an improved end point for CVD chambers.

Claim Rejections - 35 USC § 103

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yin et al. (see discussion above) in view of Chow et al. of USPN 6,872,322.

The teachings of Yin are silent as to the types of reactant gas used for chamber conditioning, as in claims 10 and 11.

Chow teaches it is conventional to use of the reactant gas containing silicon (col. 13, l. 55-60), or NH.sub.3 (col. 9, l. 11, and 26-30) when conditioning a chamber (col. 12, l. 13-17) as in claims 10 and 11.

As for claim 10, Chow teaches the exposing comprises the reactant gas containing at least one of a silicon-containing gas (col. 13, l. 55-60) for conditioning the system component during a chamber conditioning process (col. 12, l. 13-17).

As for claim 11, Chow teaches the exposing comprises the reactant gas containing at least one of dichlorosilane and NH.sub.3 (col. 9, l. 11, and 26-30) for conditioning the system component during a chamber conditioning process.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to modify the invention of end point detection, of Yin, to detect the end of a process using dichlorosilane or a nitrogen containing gas because Yin teaches it is well known that conditioning the chamber as it creates the byproduct of a passivation layer.

Claim Rejections - 35 USC § 103

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yin (see discussion above) in view of Kim et al. (USPN 6,436,303).

Yin teaches the process parameter of chamber pressure is typically from 0.1 to 400 mTorr, which overlaps the applicants' range of 200mTorr to about 760Torr.

Yin is silent as to the process parameter of temperature, as in applicants' claim 18.

Kim teaches an effective range for etching chamber temperature from about 200 to 800.degree C. (l. 39-40), as defined by claim 18.

It would have been obvious to one ordinary skill in the art at the time of invention was made to select a process temperature, as Kim, when etching, as Yin, because Kim teaches an effective etching process for accomplishing the desired etch.

Claim Rejections - 35 USC § 103

Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yin in view of Nakata et al. (USPN 5,989,928).

See discussion on the teachings of Yin above.

Yin does not teach the use of a gas mass sensor.

Nakata teaches the wide use of spectral analysis (col. 6, l.2) measuring from a specified species (col. 5, l. 32, written on "selected"). Nakata also teaches that mass spectrometry (col. 1, l. 37-42) is taught in prior art which includes detecting radicals(col. 1, l. 38) or ions (col. 1, l. 39) such as an etching gas (col. 1, l. 39) or a decomposition (col.1, l. 39) product or reaction product of emissions (col. 1, l. 40).

As for claim 23, Nakata teaches prior art uses the monitoring comprises using a mass sensor to detect a mass signal from the erosion product (col. 1, l. 37-42).

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As for claim 24, Nakata teaches the monitoring further comprises determining if an intensity level of the spectral analyzer has reached a threshold value (col. 6, l. 27-29), which is written on the limitation "mass signal".

It would have been obvious to one ordinary skill in the art at the time of invention was made, to modify the end point detection teachings of Yin to include the use of mass spectrometry of Nakata, because Nakata teaches improvements.

Response to Arguments

Applicant's arguments filed 10/25/2006 have been fully considered but they are not persuasive. Examiner acknowledge applicants' further limitation "the system component being different that the semiconductor substrates," however, the term substrate will be interpreted as being the wafer start material, i.e. the bottom most layer of the wafer which existed before the wafer fabrication steps for forming an IC occur.

Applicants' arguments are not persuasive with respect to the fact that the reference of Yin fails to disclose a system component. The wafer disclosed by Yin et al. is considered to read on a system component because it is made of the same material defined in claim 1 (i.e. SiN), the layer is a protective coating, and not the wafer substrate. The term system component does not exclude semiconductor layers that are protective coats on wafers because applicant describes a system component as a "liner", "cap cover" "electrode", and a "protective coating". Therefore, the reference of Yin et al. stands. Please see grounds of rejection above.

Examiner disagree with applicants' argue, on page 7, that the reference of Yin et al. consistently refer to substrates and the system components as being different. Examiner only find the term "system component" used once in the reference of Yin et al. (see Background), and term is not defined. Yin et al. does use the term "component" frequently, and frequently includes the term "of the etching chamber" immediately afterward. Examiner does not find an explicit definition provided by applicant for the term "system component", but, would like to point to applicants own specification for the following description "The system component **can contain** a consumable part such as a process tube a shield, a ring, a baffle, an injector, a substrate holder, **a liner**, a pedestal, a cap cover, an electrode, and a heater, and can further contain **a protective coating**" (see Summary). Clearly, applicants use both open ended language, "can contain", and semiconductor layers, when describing some system components. It is well known that "protective coatings", "liners," "electrodes," and "cap covers" are often used to define a layers or structures on a semiconductor substrate.

With respect to applicants' argument, on page 10, the monitoring process of Tsai et al. monitors the effluent in various ways, but there is no teaching that the effluent be monitored for an erosion product; the reference of Tsai et al. clearly teaches the monitoring of an effluent of an etching process. Further, any byproduct of etching can be interpreted as an erosion product, because the term erosion is defined as "to eat away" or "destroy by slow consumption" (see <http://www.dictionary.com>; erode; 2006).

As for applicants argument, abridging pages 10-11, that the reference of Tsai et al. strives to avoid any erosion of the "system component", examiner can not find any

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reference in Tsai et al. where it is taught to avoid any erosion of the a "system component." The reference of Tsai et al. clearly teaches etching, which is erosion, therefore monitoring the effluent inherently monitors an erosion product.

Remaining remarks by applicants, on pages 11, repeat arguments presented toward claims 1 and 2, which are addressed above.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art made of record: USPN 6,894,769.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia (Patty) George whose telephone number is

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(571) 272-5955. The examiner can normally be reached between 7:00am and 4:30pm on any weekday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PAG

12/2006



LAN VINH
PRIMARY EXAMINER